UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/735,052	12/12/2003	Jari Parviainen	879A.0015.U1(US)	2487

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EXAMINER
CLEARY, THOMAS J

ART UNIT	PAPER NUMBER
2111	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/15/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

	Application No.	Applicant(s)
Office Action Summary	10/735,052	PARVIAINEN ET AL.
	Examiner	Art Unit	
	Thomas J. Cleary	2111	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS,
WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>24 November 2006</u>.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is

closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-8,10 and 11</u> is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-8,10 and 11</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage

application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1, 3, 4, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable

over US Patent Number 6,662,260 to Wertheim et al. ("Wertheim") and US Patent

Number 6,467,003 to Doerenberg et al. ("Doerenberg").

3.   In reference to Claim 1, Wertheim discloses a method for adapting a bus of a

system to data traffic, which system comprises a plurality of functional units each having

a processing unit and bus interface unit (See Figure 9 Numbers 110, 112, 114, and

116), wherein said functional units are divided into at least two sets so that the

functional units of a single set are interfaced with a separate sub-bus of their own (See

Figure 9), and said system further comprises a switching unit to unite different sub-

buses into a more extensive bus (See Figure 9 Numbers 130, 140, 150, 510 520, 522,

and 524), the method comprising: checking whether data has to be transferred across

said switching unit from one sub-bus to another, uniting the sub-buses in question if the

result from the preceding step is positive, separating the sub-buses in question again when the transfer, for which the sub-buses were united, is completed, and keeping a particular sub-bus separated from the other sub-buses if there is no data transfer need therefrom across the switching unit in either direction (See Column 4 Line 40 – Column 5 Line 14 and Column 7 Line 54 – Column 8 Line 54), wherein at least checking, uniting, separating, and keeping are implemented by said switching unit (See Column 8 Lines 27-54). Wertheim does not disclose data being transferred through said bus in time slots recurring in accordance with a certain time frame. Doerenberg teaches the use of time division multiplexing, in which data is transferred in slots recurring in accordance with a certain time frame (See Column 8 Lines 34-39).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the time division multiplexing of Doerenberg in the bus system of Wertheim, resulting in the invention of Claim 1, in order to insure that each function has guaranteed and timely access to the bus without negatively affecting any other functions (See Column 8 Lines 34-39 of Doerenberg).

4.   In reference to Claim 3, Wertheim and Doerenberg disclose the limitations as applied to Claim 1 above. Doerenberg further teaches the use of a table drawn up beforehand to determine whether data has to be transferred in a certain time slot (See Column 35 Line 65 – Column 36 Line 23).

5.   In reference to Claim 4, Wertheim and Doerenberg disclose the limitations as

applied to Claim 1 above. Wertheim further discloses that the clock signals of each

sub-bus are synchronized, and thus the uniting of the sub-buses in the combination will

occur when a time-slot is changing (See Figure 2 'CLOCK').

6.   In reference to Claim 7, Wertheim discloses a bus structure of a system

comprising a plurality of functional units each having a processing unit and bus interface

unit (See Figure 9 Numbers 110, 112, 114, and 116), wherein to increase a transfer

capacity of the bus, the bus structure comprises at least two sub-buses with address

data and control lines (See Column 1 Lines 32-39) to each of which there is interfaced a

set of said functional units (See Figure 9), the bus structure further comprising a

switching unit to unite said sub-buses into a more extensive bus (See Figure 9 Numbers

130, 140, 150, 510 520, 522, and 524; Column 4 Line 40 – Column 5 Line 14; and

Column 7 Line 54 – Column 8 Line 54) and a power management unit to minimize

energy consumption of the bus structure (See Column 4 Lines 50-64), which switching

unit comprises a switch control unit joining the control lines of the sub-buses (See

Column 8 Lines 27-54). Wertheim does not disclose data being transferred through

said bus in time slots recurring in accordance with a certain time frame. Doerenberg

teaches the use of time division multiplexing, in which data is transferred in slots

recurring in accordance with a certain time frame (See Column 8 Lines 34-39).

·It would have been obvious to one of ordinary skill in the art at the time the

invention was made to use the time division multiplexing of Doerenberg in the bus

system of Wertheim, resulting in the invention of Claim 7, in order to insure that each function has guaranteed and timely access to the bus without negatively affecting any other functions (See Column 8 Lines 34-39 of Doerenberg).

7.   Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wertheim and Doerenberg as applied to Claim 1 above, and further in view of US Patent Application Publication Number 2004/0128413 to Chelsea et al. ("Chelsea").

8.   In reference to Claim 5, Wertheim and Doerenberg disclose the limitations as applied to Claim 1 above. Wertheim and Doerenberg do not disclose that the clock signals of the sub-buses are not synchronized to one another and lengthening, if necessary, a clock cycle of one sub-bus to keep a data transfer within a single time slot in both sub-buses. Chelsea teaches a system in which two sub-buses are not synchronized and in which the clock signal can stretched in order to ensure that data can be transmitted between the buses (See Paragraph 11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to construct the device of Wertheim and Doerenberg with the non-synchronized buses and clock stretching of Chelsea, resulting in the invention of Claim 5, in order to allow devices in order to allow devices in different clock domains to communicate with each other reliably and with low latency (See Paragraphs 5 and 11 of Chelsea).

9.   Claims 2 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Wertheim, US Patent Number 5,630,145 to Chen ("Chen"), and US Patent Application

Publication Number 2001/0003206 to Pole, II et al. ("Pole").

10.   In reference to Claim 2, Wertheim discloses a method for adapting a bus of a

system to data traffic, which system comprises a plurality of functional units each having

a processing unit and bus interface unit (See Figure 9 Numbers 110, 112, 114, and

116), between said functional units data being transferred through said bus, wherein

said functional units are divided into at least two sets so that the functional units of a

single set are interfaced with a separate sub-bus of their own (See Figure 9), said

system further comprising a switching unit to unite different sub-buses into a more

extensive bus (See Figure 9 Numbers 130, 140, 150, 510 520, 522, and 524).

Wertheim does not disclose that the supply voltage of the sub-bus is settable to at least

two different levels quantifying a mean data traffic rate for each sub-bus, setting the

supply voltage of a sub-bus to the lower one of said two levels if the data traffic rate of

the sub-bus is smaller than a certain value. Chen teaches reducing the frequency on a

bus when the bus activity drops to zero (See Column 1 Lines 27-36), which is dropping

below a certain level. In order to determine that the bus activity has dropped to zero,

Chen must quantify the mean data traffic rate. Pole teaches that the supply voltage can

be lowered when the frequency of the clock is lowered (See Paragraph 14).

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to construct the device of Wertheim with the reduced frequency

and voltage of Chen and Pole, resulting in the invention of Claim 2, in order to save

power when the bus is not being used (See Column 1 Lines 30-36 of Chen); and to

save further power because the power dissipation of the bus is proportional to the

square of the supply voltage (See Paragraph 14 of Pole).

11.   In reference to Claim 6, Wertheim, Chen, and Pole disclose the limitations as

applied to Claim 2 above. Chen further teaches that the data traffic rate is determined

based on the data transfer needs of application processes currently running on the

system (See Column 1 Lines 13-36).

12.   Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wertheim

and Doerenberg as applied to Claim 7 above, and further in view of US Patent

Application Publication Number 2001/0008550 to Takahashi ("Takahashi").

13.   In reference to Claim 8, Wertheim and Doerenberg disclose the limitations as

applied to Claim 7 above. The bus of Wertheim will inherently include supply voltage

stabilizers, as the bus would be inoperative if the supply voltage of the bus were to

fluctuate. Wertheim and Doerenberg do not disclose that the power management unit

comprises a frame synchronization unit. Takahashi teaches a frame synchronization

unit for reducing power consumption (See Paragraph 2).

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to construct the device of Wertheim and Doerenberg with the frame

synchronization unit of Takahashi, resulting in the invention of Claim 8, in order to

reduce power consumption (See Paragraph 2 of Takahashi).

14.   Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Wertheim and Doerenberg as applied to Claim 7 above, and further in view of US

Patent Number 6,079,024 to Hadjimohammadi et al. ("Hadjimohammadi").

15.   In reference to Claims 10 and 11, Wertheim and Doerenberg disclose the

limitations as applied to Claim 7 above. Wertheim further discloses that each of the

functional units comprises a bus interface unit (See Figures 1 and 9) and a control unit

to store functional units' data transfer information and to arrange for the data transfers

(See Column 5 Lines 28-36). Wertheim and Doerenberg do not disclose that the bus

interface has a first buffer memory to store data and address information to be sent, a

second buffer memory to store received data and address information, as in Claim 10,

and that the first and second buffer memories are of the FIFO type, as in Claim 11.

Hadjimohammadi teaches a bus interface which has a transmit FIFO buffer and a

receive FIFO buffer (See Column 4 Lines 3-24).

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to construct the device of Wertheim and Doerenberg with the

transmit and receive FIFO buffers of Hadjimohammadi, resulting in the inventions of

Claims 10 and 11, in order to allow multiple data transfers to be performed concurrently

(See Column 4 Lines 14-24 of Hadjimohammadi).

Claim Rejections - 35 USC § 112

16.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly
> claiming the subject matter which the Applicant regards as his invention.

17.   Claims 1 and 3-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear if "relating to an individual time slot" is a part of the method (such as the parts of checking, uniting, separating, and keeping), or if the method relates to an individual time slot.

18.   Claims 7-8 and 10-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. It is unclear if the switch control unit is joined (connected) to the control lines of the sub-buses, or if the switch control unit is for joining (connecting) the control lines of separate sub-buses together.

Response to Arguments

19.   Applicant's arguments filed 24 November 2006 have been fully considered but they are not persuasive.

20.   Applicant has argued that there is only one functional unit connected to each
sub-bus and thus there is not a set of functional units connected to each sub-bus (See
Page 7 Paragraphs 2-3). In response, the Examiner notes that Applicant's claims only
require a plurality of functional units in the system, and does not require a plurality of
functional units in a set. Further, a set is not limited to having multiple elements. A set
can have zero, one, or multiple elements. Specifically, a set containing a single element
is commonly known as a "singleton set" (See "Singleton Set" in Wolfram MathWorld).
Thus, a system having only one functional unit connected to each sub-bus is within the
claimed scope.

21.   Applicant has argued that, as there is no need for any time division system when
two units have been connected, there is no motivation to combine Doerenberg with
Wertheim (See Page 8 Paragraph 2). In response, the Examiner notes that systems in
which a point-to-point architecture (having only two units connected together) is used
with a time-division multiplexing are well known in the art (See US Patent Number
6,389,033 to Maxwell et al.; US Patent Application Publication Number 20030193889 to
Jacobsen; and US Patent Application Publication Number 20010038613 to Gray).
Time-division multiplexing is useful in these systems to ensure that each device
receives fair access to the bus.

22.   Applicant has argued that the checking, uniting, separating, and keeping are implemented by the switching unit (See Page 8 Paragraph 3). In response, the Examiner notes that checking, uniting, separating, and keeping are implemented by the switching unit of Wertheim (See Figure 9 Numbers 130, 140, 150, 510 520, 522, and 524 and Column 8 Lines 27-54).

23.   Applicant has argued that the switching control unit does not have an interconnection to the bus segments (See Page 9 Paragraph 1). In response, the Examiner notes that the source-destination decoders are part of the switch control unit of Wertheim (See Figure 9 Numbers 130, 140, 150, 510 520, 522, and 524; Column 4 Line 40 – Column 5 Line 14; and Column 7 Line 54 – Column 8 Line 54) which is connected to the sub-buses.

24.   Applicant has argued that Chen discloses not only reducing the bus speed, but stopping the clock signal altogether (See Page 9 Paragraph 6). In response, the Examiner notes that the claim language does not prohibit the clock signal from being stopped. A bus in which the clock signal is stopped has a clock signal frequency of zero. A frequency of zero is less than any frequency which is not zero, and thus, the frequency has been reduced.

25.   Applicant has argued that Chen discloses stopping a clock signal when the bus activity is zero and not when it is below a certain level (See Page 10 Paragraph 1). In

response, the Examiner notes that when the traffic on the bus drops to zero, it has

dropped below a certain level, namely, the level separating traffic from no traffic. Upon

dropping below the level upon which there is traffic on the bus, and thus dropping to the

level of zero traffic, Chen teaches stopping the bus, which is equivalent to reducing the

bus speed to zero.

26.   In response to Applicant's argument that Chen could not be incorporated into

Wertheim (See Page 10 Paragraph 2), the test for obviousness is not whether the

features of a secondary reference may be bodily incorporated into the structure of the

primary reference; nor is it that the claimed invention must be expressly suggested in

any one or all of the references. Rather, the test is what the combined teachings of the

references would have suggested to those of ordinary skill in the art. See *In re Keller*,

642 F.2d 413, 208 USPQ 871 (CCPA 1981). Chen was relied upon to disclose that, as

admitted by the Applicant, lowering the frequency of a bus to reduce power

consumption is well known. Further, although Chen discloses performing the power

consumption on a hierarchical PCI bus, it is not limited as such (See Column 5 Lines

12-20).

27.   Applicant has argued that the combination of Chen and Pole does not disclose

quantifying a mean data traffic rate for each sub-bus and setting the supply voltage of a

sub-bus to the lower one of said two levels if the data traffic rate of the sub-bus is

smaller than a certain value (See Page 10 Paragraph 3 – Page 11 Paragraph 1). In

response, the Examiner notes that Chen discloses reducing the frequency on a bus

when the bus activity drops to zero (See Column 1 Lines 27-36), which is dropping

below a certain level. In order to determine that the bus activity has dropped to zero,

Chen must quantify the mean data traffic rate. Pole discloses that the supply voltage

can be lowered when the frequency of the clock is lowered (See Paragraph 14). Thus,

since Chen discloses lowering frequency when bus activity drops below a certain level,

and Pole discloses that the supply voltage can be lowered when the frequency is

lowered, Chen and Pole in combination disclose lowering the supply voltage when bus

activity drops below a certain level.

Conclusion

28.   Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of
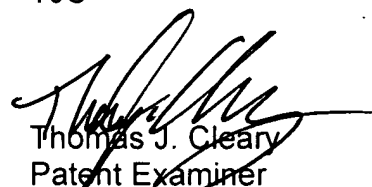
the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.
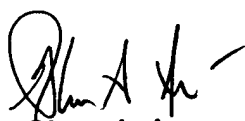
Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Thomas J. Cleary whose telephone number is 571-272-3624. The Examiner can normally be reached on Monday-Thursday (7-3), Alt. Fridays (7-2).

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Rinehart can be reached on 571-272-3632. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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